

WE CLAIM:

1. A device comprising a substrate having a plurality of different molecular probes attached to a surface thereof and an integrated indicator that exhibits a response
5 when exposed to a condition to which the substrate may be exposed,
wherein each different molecular probe is selected to interact with a corresponding target, and further wherein the indicator response is detectable after removing the indicator from the condition.
- 10 2. The device of claim 1, wherein the indicator response to the condition is detectable for at least 1 minute after removing the indicator from the condition.
3. The device of claim 2, wherein the indicator response to the condition is detectable for at least 1 hour after removing the substrate from the condition.
- 15 4. The device of claim 3, wherein the indicator response to the condition is substantially permanently detectable.
5. The device of claim 1, wherein the condition is an environmental condition
20 that allows for target-probe interaction.
6. The device of claim 5, wherein the environmental condition is a predetermined temperature.
- 25 7. The device of claim 6, wherein the predetermined temperature is a maximum temperature.
8. The device of claim 7, wherein the maximum temperature is about 60°C to about 90°C.

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9. The device of claim 6, wherein the predetermined temperature is a minimum temperature.

10. The device of claim 9, wherein the minimum temperature is about 35°C to
5 about 45°C.

11. The device of claim 5, wherein the environmental condition is
apredetermined water content.

10 12. The device of claim 5, wherein the environmental condition is a chemical
concentration.

13. The device of claim 12, wherein the chemical concentration is a formamide
concentration,
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14. The device of claim 12, wherein the chemical concentration comprises a pH
of about 5 to about 9.

15. The device of claim 12, wherein the chemical concentration is a salinity of
20 about 0.01 molar to about 8 molar.

16. The device of claim 1, wherein the condition is the presence of a chemical
moiety that affects the target-probe interaction.

25 17. The device of claim 16, wherein the chemical moiety hinders the target-probe
interaction.

18. The device of claim 16, wherein the chemical moiety enhances the target-
probe interaction.
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19. The device of claim 1, wherein the indicator response is optically detectable.

20. The device of claim 19, wherein the indicator response is detectable as fluorescence emission.

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21. The device of claim 19, wherein the indicator response is detectable as fluorescence quenching.

22. The device of claim 19, wherein the indicator is chemiluminescent and the
10 indicator response is detectable as chemiluminescence.

23. The device of claim 1, wherein the indicator response is magnetically detectable.

24. The device of claim 1, wherein the indicator response is electrically
15 detectable.

25. The device of claim 1, wherein the indicator response is machine detectable.

26. The device of claim 1, wherein the response occurs after exposure of the
20 indicator to the condition for at least a predetermined period.

27. The device of claim 26, wherein the predetermined period is about 1 minute
to about 28 hours.

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28. The device of claim 27, wherein the predetermined period is about 5 to about
10 hours.

29. The device of claim 28, wherein the predetermined period is about 6 to about
30 8 hours.

30. The device of claim 1, wherein the molecular probes are biomolecular.

31. The device of claim 30, wherein the molecular probes are nucleotidic.

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32. The device of claim 30, wherein the molecular probes are peptidic.

33. The device of claim 30, wherein the molecular probes are oligomeric.

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34. The device of claim 30, wherein the molecular probes are polymeric.

35. The device of claim 1, wherein the molecular probes are arranged in an array on the substrate surface.

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36. The device of claim 35, wherein the array comprises at least about 10 probes per square centimeter of substrate surface.

37. The device of claim 36, wherein the array comprises at least about 50,000 probes per square centimeter of substrate surface.

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38. The device of claim 37, wherein the array comprises at least about 200,000 probes per square centimeter of substrate surface.

39. The device of claim 38, wherein the array comprises at least about 1,000,000 probes per square centimeter of substrate surface.

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40. The device of claim 1, wherein the substrate further contains machine-readable information.

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41. The device of claim 40, wherein the substrate further comprises a medium on which information may be written.

5 42. The device of claim 41, wherein the medium is selected to contain electronic information.

43. The device of claim 41 wherein the medium is noncoplanar with respect to the surface on which the molecular probes are attached.

10 44. The device of claim 43, wherein the medium is writable from a surface that opposes the surface on which the molecular probes are attached.

45. The device of claim 1, wherein the substrate comprises a disk.

15 46. The device of claim 1, wherein the substrate comprises a tape.

47. The device of claim 1, wherein the substrate comprises a well plate.

20 48. The device of claim 1, wherein the substrate comprises a slide.

49. The device of claim 1, wherein the targets represent portions of a single molecule.

25 50. The device of claim 1, wherein the targets represent portions of single cell.

51. The device of claim 1, wherein the integrated indicator comprises nucleotidic material.

30 52. A device comprising a substrate having a plurality of molecular probes attached to a surface thereof and a plurality of different integrated indicators, each

indicator selected to exhibit a response when exposed to one of a plurality of conditions to which the substrate may be exposed, wherein the molecular probes are selected to interact with corresponding targets, and further wherein the response of each indicator is detectable after removing each indicator from the condition.

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53. The device of claim 52, wherein the molecular probes are selected to interact with corresponding targets when exposed to at least one of the plurality of conditions.

54. The device of claim 53, wherein the molecular probes are selected to interact
10 with corresponding targets when exposed to all of the conditions.

55. The device of claim 54, wherein the molecular probes are selected to interact with corresponding targets when exposed to all of the conditions simultaneously.

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56. A device comprising a substrate having a plurality of nucleotidic molecular probes attached to a surface thereof and an integrated indicator that exhibits a response when exposed to a condition to which the substrate may be exposed, wherein the nucleotidic molecular probes are selected to interact with corresponding targets, and further wherein the response is detectable after removing the indicator from the
20 condition.

57. The device of claim 56, wherein the condition represents a hybridization condition between the probes and targets.

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58. A device comprising a substrate having a surface adapted for attachment to a plurality of molecular moieties and an integrated indicator that exhibits a response when exposed to a condition, wherein the response is detectable after removing the indicator from the condition.

59. The device of claim 58, wherein the condition is suitable for attaching the plurality of molecular moieties to the substrate surface.

60. The device of claim 58, wherein the condition is not suitable for attaching the
5 plurality of molecular moieties to the substrate surface.

61. An apparatus for attaching molecular moieties to the substrate surface of the device of claim 58, comprising:

an indicator-response detector for detecting whether the indicator exhibits the
10 response to the condition; and
a means for attaching a plurality of molecular moieties to the surface of the substrate.

62. The apparatus of claim 61, wherein the attaching means is activated if the
15 indicator-response detector detects the response to the condition.

63. A method for attaching molecular moieties to a substrate surface, comprising attaching a plurality of molecular moieties to the substrate surface if the integrated indicator of the device of claim 58 exhibits a response to the condition.
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64. A method for attaching molecular moieties to a substrate surface, comprising attaching a plurality of molecular moieties to the substrate surface if the integrated indicator of the device of claim 58 does not exhibit a response to the condition.

65. An apparatus for assaying a sample using the molecular probes attached to substrate surface of the device of claim 1, comprising:
an applicator for applying a sample to the molecular probes; and
an indicator-response detector for detecting whether the indicator of the device of claim 1 exhibits a response.
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66. The apparatus of claim 65, further comprising an interaction detector for detecting probe-target interactions.

5 67. The apparatus of claim 66, wherein the interaction detector is an optical detector.

68. The apparatus of claim 67, wherein the interaction detector is a fluorescence detector.

10 69. The apparatus of claim 66, wherein the interaction detector is a magnetic detector.

70. The apparatus of claim 66, wherein the interaction detector is an electrical or electrochemical detector.

15 71. The apparatus of claim 66, wherein the interaction detector is activated when the indicator-response detector detects a response by the indicator.

20 72. The apparatus of claim 66, wherein the interaction detector is deactivated when the indicator-response detector detects a response by the indicator.

73. The apparatus of claim 65, wherein the indicator-response also serves as an interaction detector for detecting probe-target interactions.

25 74. A method for assaying a sample, comprising the steps of:

- (a) exposing the device of claim 1 to an assay condition by contacting the sample with the molecular probes attached to the substrate surface of the device;
 - (b) detecting whether the indicator exhibits the response to the condition; and
 - (c) detecting for probe-target interactions if the indicator exhibits the response to
- 30 the condition.

75. The method of claim 74, wherein step (a) comprises placing the sample and the device in a controlled environment.

5 76. The method of claim 75, wherein step (a) comprises heating the device while the sample is in contact therewith.

77. The method of claim 75, wherein step (a) comprises preventing the sample from evaporating.

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78. The method of claim 74, further comprising, after step (a) and before step (b), (a') removing excess sample from the device.

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79. The method of claim 74, wherein steps (b) and (c) are carried out using a single reader.

80. The method of claim 74, further comprising, after step (b), (b') recording whether the response occurred as information contained in the device.

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81. The method of claim 74, further comprising, after step (c), (c') recording whether the probe-target interaction occurred as information contained in the device.

82. A method for assaying a sample, comprising the steps of:

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(a) exposing the device of claim 1 to an assay condition by contacting the sample with the molecular probes attached to the substrate surface of the device;

(b) detecting for probe-target interactions if the indicator does not exhibit the response to the condition.